

The Mobilus Initiative: Creating A New Component of the US Aerospace Industry Centered Upon Transport Airships

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The United States requires greater mobility to meet burgeoning military and commercial demands. The US aerospace industry shows signs of faltering and losing its preeminent position in the world and our national economy. Improving the efficiency of the existing air transportation system and its components, including the introduction of new types of airplanes, while critical and achievable, cannot by itself provide enough overall gain in capability to meet future commercial and military needs. The Nation needs a new component of the aerospace industry – a key element of our economic power – to create a new transport capability in the civilian sector the military can draw upon when necessary. A different type of airlift platform is necessary. A new initiative is essential to cause the creation of the required capability, and it must use a method copied from success in the private sector rather than traditional government paths that have failed.

Only Lighter-Than-Air (LTA) technology--derided, often wildly misunderstood and largely ignored for the last 50 years--actually offers the potential to provide tremendous increases in volume, speed and accessibility for air movement around the world. LTA technology offers new types of aircraft, more complete utilization of airspace, and supports a more fully networked concept to air transportation. The nation needs to move *more, faster, point-to-point* from various points of origin to relevant locations worldwide. Only the atmosphere provides us a navigable ocean that reaches all points on the planet to which we may maneuver. Thus we must fly, and only exploiting LTA technology will allow us to do so with a payload more akin to a ship than a plane.¹ Only such transport airships² will enable us to be *Mobilus in Mobile*³ – Mobile Within The Mobile Element.

Discussion of the value of transport airships often does not meet disbelief, but rather an acceptance of the value and an awareness of many previous ill-defined or oversold governmental efforts over many years. The Mobilus Initiative exists precisely to rapidly create a broad, diverse commercial sector capability and avoid repeating past errors.

The developmental path we must follow emerges from thorough study of the many previous failures, and successes, of past LTA efforts in the public and private sectors. The failures have generated great cynicism and misinformation, but they and the successes also provide many lessons to take forward. The “build it and they will come” mantra has repeatedly failed. Success depends upon a realistic, long-term view that factors in realistic cost and time estimates, realistic technical developmental paths,

¹ See the first article in this series, [Fantasy to Prophecy, The Need for a New Lighter-Than-Air Aerospace Capability](#), (Transformation Trends article dated 11 March 04) for substantial background data.

² The term “airship” includes various types. Ongoing research of past studies, work with the FAA and multiple LTA “greybeards” showed that earlier use of terms such as “hybrid air vehicle” by the author and other variants of “hybrid” by others were incorrect. Diagrams later in this article further clarify this.

³ Latin: with the English translation shown in the text. Nothing more aptly describes a ship operating within the ocean of air.

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considers training, utilizes all remaining first hand human experience, and includes key parts of the private sector.

Not only is technology alone not enough, nor is a solely military or even governmental effort. This article describes the Vision—a worldwide LTA industry--towards which we must focus efforts and the non-traditional path—a public/private partnership unlike any other-- we must follow to create a broad, sustainable new aerospace capability, and the resultant national advantage, within two decades. This Vision, and the method to realize it, is Mobilus—a new mobility for our Nation, and a challenge for the 21st Century.

These airships do not yet exist, but are technically feasible. Historical data and the body of significant conceptual engineering work over the past decades enables realistic prediction of airships within the near term capable of payloads measured in thousands of square feet of deck space and perhaps 200 tons⁴ of cargo capacity. These ships would cruise around the clock at speeds between 60-90 MPH origin-to-destination and operate independent of traditional airports and seaports. Think in terms of nearly 3 C-5s or 4-5 C-17s of capacity. These rough estimates of a future capability do not require significant technical breakthroughs. The challenge lies far more in closing the business case, in project management, in training crews, in operating airships and in organizing the required value networks to finance, create and operate them. The “right tech” is not necessarily “high tech”. Technological advances are critical to achieve the more demanding sizes that many hope for, but the laws of physics, economics and human nature remain in effect so we must address the entire challenge.

This article describes the key military/civilian/aerospace industry needs and opportunities to show how transport airships offer a common solution to multiple problem sets. The bulk of the paper describes the Mobilus Initiative in greater detail.

Nexus of Challenges and Opportunities

The US Aerospace Industry is essential to the very existence of our national commercial and military mobility. A new LTA centered aerospace sector is attainable and will make an extremely significant quantifiable improvement in our mobility capability and to the US Aerospace Industry. It also supports several of the core strategies for transforming the Next Generation Air Transportation System.⁵

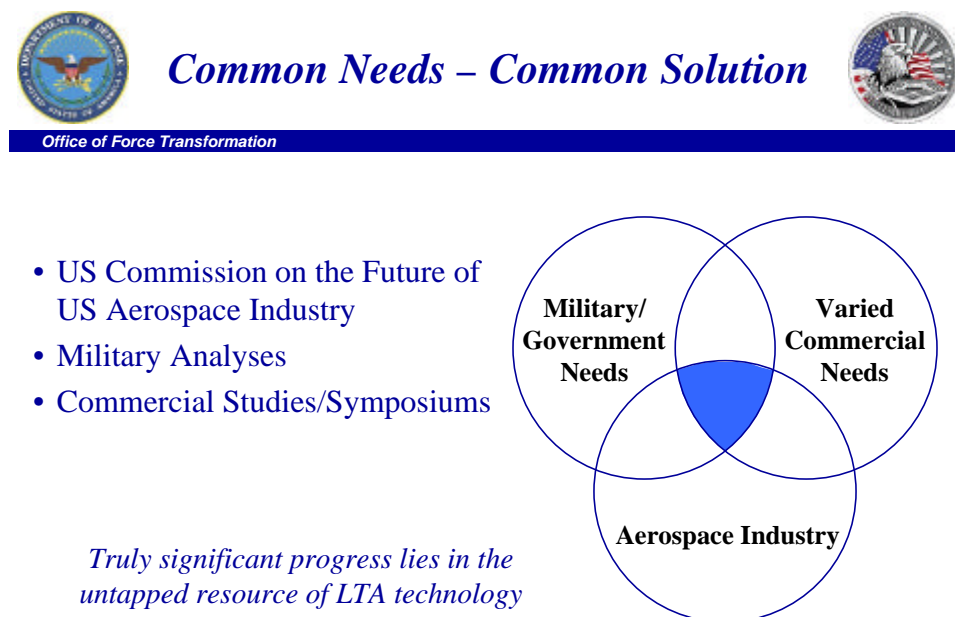
While each individual cargo-carrying airship would be capable of significant payload and range, it will take dozens or more ships to achieve truly significant impact. The US Department of Defense cannot develop, operate, crew and maintain a fleet of transport airships no matter how valuable. We are at war, and cannot sacrifice current capabilities

⁴ Payload depicted in tonnage can be deceptive. Airship design contains many critical trade-off decisions, but 200 tons is a defensible figure for current designs and fabric strength that physically exists in sample size. It also reflects previous military deployment modeling, and an amount of unit equipment believable for smooth staging and flow. Further analysis, such as the Army is now doing, will expand these points.

⁵ References to the Joint Planning and Development Office (JPDO) Futures Working Group/related efforts come from the author’s ongoing work with the JPDO, an interagency group mandated by Congress to transform the US civil air transportation system.

(force structure, funding for a full development, etc.) for potential future ones. Development would also be too slow. A cursory inspection of traditional acquisition programs shows delays and cost increases of 40% are common. That means that we will use civilian assets in a manner similar to the current Civil Reserve Air Fleet (CRAF) model. The next step in the logic is that a civilian sector of airships/other LTA vehicles must exist on a large scale.

Figure 1: Nexus of Needs and Opportunity



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The problems and weaknesses across the military needs, commercial needs, and the aerospace industry itself suggest that solutions must apply across all three areas. This is a challenge in itself, but it is also the key opportunity we will exploit. Mobilus will identify the most sensible paths of development and the value networks across government and the private sector to develop airships to meet varied commercial needs. Consortiums are proven effective in harnessing the power of the free market and legal mechanisms exist to help small companies produce technology that they cannot do alone.

Mobilus Vision

The Mobilus Vision is of a future worldwide LTA industry, a robust and complementary component of the current aerospace industry made up of varied types of airships of various design types performing varied commercial functions throughout the world. Commensurate with the network of airships will be a similar network of facilities, both maintenance and construction, personnel to crew and maintain the ships, lifting gas

production, distribution, storage and purification, more precise weather forecasting, the training base for those who operate and maintain ships, and management of operations.

The US military will utilize this commercial asset of transport airships and their support structure in a manner similar to how we now use airplanes through the Civil Reserve Air Fleet (CRAF). Airships will not reside primarily within military force structure. This civilian capability must be broad, deep, and develop as rapidly as reasonably possible. Military considerations will be a key component of development from its inception and the military will be a crucial first customer as well.

Why This Path Will Realize The Vision

Mobilus is the Vision of the desired endstate and the method to achieve that endstate. The fundamental core of this method is that of a public-private partnership, in this case a type of technology-sharing consortium, though with some unique aspects. This choice of method is recognition of reality and of successful precedent.⁶ Major industries have long pooled efforts in innovation in recognition of the overall efficiency of this approach and the fact that such a win/win approach is most efficient and least risky. Innovators have strong incentives to share innovations and technology-sharing consortia are quite stable.⁷

Mobilus will identify the best technical developmental path(s), identify the key stakeholders who will share in the development, and identify the most efficient overall path(s) by which various value networks of stakeholders should move toward their desired goals within the endstate. Key stakeholders will join in public-private partnerships (P3s) to develop actual cargo-carrying airships and the required support networks – operators, trainers, maintainers, etc.

Arguably, no previous business case closed because developing an airship capability is too big for any company and arguably even for government acting alone. Mobilus, by identifying all relevant participants, working with them to accurately identify the risk and reward for all participants (in a collaborative effort) and showing a comprehensive development path, realistic time line and realistic cost estimate reduces collective risk. One person may not step forward into the unknown, but a team of many will step forward together.

“Civil aerospace faces declining federal funding and US worldwide leadership...corporations are risk averse and short-term oriented... the most significant change in our industry is the need for cooperation or ...teaming. Pure technology is, of itself, not the answer anymore.”⁸

⁶ Many large-scale precedents exist in the semiconductor, automotive and other industry sectors. Dr. Bruce Holmes of NASA Langley has pioneered several major efforts in the civil aviation arena using consortia.

⁷ A rationale for the use of consortia is found in William Baumol's The Free-Market Innovation Machine: Analyzing the Growth Miracle of Capitalism, 2002, Chapters 3, 4 and 7.

⁸ Dr. Donald Richardson interview, AIAA Bulletin, October 2003. Dr. Richardson is the President of the American Institute of Aeronautics and Astronautics.

Military Mobility Needs

Current military operations are always limited by the availability of “lift”. The desired forces simply cannot be moved through time and space in the volume and tempo operational planners want. Developing Service concepts of operations and logistics demonstrate a tremendous, perhaps even exponential, increase in future movement demands, especially within a theater of operations. To provide an asymmetric advantage for our forces and counter the multiple forms of anti-access, we need the capability to rapidly deliver large volumes/heavy payloads directly to the desired destination, independent of existing infrastructure.⁹

Multiple deployment analyses show the value of Ultra-Large Airlifters (ULAs)¹⁰, the generic term for this capability. They improve overall force closure as well as offering entirely new ways to package and deploy specific capabilities such as hospitals, C2 nodes, bridge building materials, etc. A point-to-point capability and high volume cargo bays translates into significantly faster employment of units such as helicopters (lightweight but large footprints) and also of heavier, denser units that then use the vacated deck space on sealift to move sooner. Remembering that sealift carries 90% of units and sustainment cargo, one can see that an airship provides a useful surge capability early on and also fits a sector between sealift and airlift – combining the better qualities of both. Such a platform blurs the line between inter and intra theater deployment and moves toward the deploy/employ paradigm.

Cobra Gold 97 Example:

One real world deployment provides an illustrative example of exactly how airships could alter deploy/maneuver patterns. During the Cobra Gold 97 exercise in Thailand, the Joint Task Force deployed a large part of its equipment using commercial assets to deliver directly to final deployment area 400 miles inside Thailand without the owning unit touching the cargo enroute. This offered a glimpse of what origin-to-destination could truly mean with the right mobility platform – load and unload only once, soldiers not tied up at various places waiting to load, unload or stage, and rested personnel linked smoothly with equipment where really needed rather than after days of road movement. There were no large open areas of firm ground suitable for the offloading and staging of equipment, so small motor pools at Thai Army camps became “ports” where large cranes unloaded containers from commercial trucks, staged the unit equipment, and smoothly flowed in the JTF.

⁹ This destination will vary by mission and situation. The chosen destination’s landing zone would not be in direct enemy contact, but would be as close as possible to the actual area of employment of the capability.

¹⁰ This term, coined by BG Charlie Fletcher in 2000, refers to a capability manifested in airships of various types (e.g. conventional, crane type, hybrid-rotary, hybrid lifting-body, etc.) that use lifting gas for most of the buoyancy (lift), have a payload far greater than conventional aircraft, range in the thousands of miles, speed significantly greater than surface ships, and do not require significant infrastructure for operations.

Two other key learning points emerge. First, there are fewer large open areas in the world than many assume, so long field lengths (over 750-1000 feet) can be quite a limiting factor in many areas, but that multiple small delivery areas (or landing zones) can flow forces smoothly. Another lesson came from a Mobile Army Surgical Hospital (MASH). Such a unit consumes a large portion of the square footage available on sealift because of its many organic vehicles and trailers. Yet when the actual assembled facility is amazingly small. The capability to move a pre-assembled hospital from the US directly to the field in Phitsanolouk would have saved significant money, allowed more equipment from other units to move faster and provided a medical capability in theater faster. An airship, moving directly from point of origin to a desired location in a relatively small, yet open area, would have proved extremely valuable. The ‘origin’ in this example is the US, various Pacific bases, and the seaport of Lam Chabang, where sealift cargo offloaded. These related but different missions suggest the utility of a mix of airship types.

Vertical Maneuver:

The fact that there are few small, yet suitable, open areas does not just apply to Asia. It is a worldwide phenomenon. Cartographic work performed independently by both the Center for Army Analysis and the Boeing Company, demonstrated significant differences in availability of landing areas 500 feet or less in length/width, areas 750-1000 feet in length, and other larger zones. Multiple airship designs will provide military users with a mix of capabilities that can be tailored to meet different payload movements and suitable landing zones. Those designs will be chosen based on a mix of mission demands and technical and cost realities.

Civil Governmental Mobility Needs

Governments have concerns about national mobility separate from purely military ones. National sovereignty and access to an entire nation’s area also factor into the equation in Canada. 70% of Canada is not accessible by road. The cost of supplying remote settlements of the First Nations peoples is high, existing aircraft are nearing the end of their useful lives and replacement aircraft have higher operating costs.¹¹

Within the United States, all population centers are not equally well connected by a robust transportation network. The Futures Working Group of the Joint Planning and Development Office sessions identified the need across many potential futures (worse environment, increased terrorism concerns, revised international balances of power and economics) for a fully networked transportation system with much greater cargo capacity from point to point across the US, this hemisphere, and in new patterns worldwide.

¹¹ Dr. Barry Prentice, University of Manitoba at Winnipeg. The cited examples are a sample of material presented by at various symposiums, including the two “Airships to the Arctic” conferences that he has arranged over the past years. Dr. Prentice has graciously supplied the author with information and coordinated overall efforts since 2002.

Commercial Mobility Needs

The inability to move large volume and/or large heavy cargo to remote locations, or to move it from point to point in other areas at a reasonable cost and speed, means that certain business cannot be done – e.g. certain mineral deposits are not exploited --and that other business is done less efficiently than it could be done. These demand densities will require concentrated effort to properly quantify. The identification of commercial value is twofold. The identification of commercial value is twofold. First, there are areas of business where we can estimate the savings a new transportation technique offers by comparing current transportation costs directly against estimated costs with airships and compare. Second, new ways to move cargo suggest savings in other parts of the business chain and perhaps in several supply chains. There will be efficiencies in reduced engineering costs, reduced manufacturing costs, reduced labor costs, more efficient and timely use of capital, and other savings.

Some initial measures can be gleaned from a survey of imported manufactured items that enter the US through eight major seaports in one year. These would be single piece shipments greater than 60 metric tons in categories such as aeronautical/aircraft, power generation, cranes, petroleum production equipment and other types. Overall, this sample totaled over 1.2 million tons. This oversized cargo currently moves inland to final destination on an inadequate infrastructure. This activity adds to surface congestion as a result of low speed transport and is costly in terms of direct cost and lost opportunity cost of capital. Airship transportation in the short range (1-300 miles) and medium range (300-800 miles) segments could increase benefits to all parties.

Normal air cargo demand is expected to triple by 2025, and desired passenger flow through existing terminals will be two to four times greater.¹² The existing air transportation network does not utilize all airspace or airports, is predominately a hub and spoke construct and ...”does not appear scaleable to meet the future”.¹³

One example of commercial usage is in pipeline construction. Currently, the process is complicated, expensive, and has significant environmental impact. Pipeline companies seek more efficient methods of moving pipe sections, equipment, and the base camps themselves both to save money and, even more importantly, to reduce the damage to the environment. Airships offer the only truly viable method of moving the volumes and weights of cargo in the remote regions of the world, particularly wooded and hilly areas. Pipelines, of course, may extend for thousands of miles, but this example focuses on one “spread” of 160 kilometers completed over 40 days, with the preparation for that work extending over many months. Currently material is barged and trucked into place and requires building roads and clearing base camps. That includes moving 7300 sections of pipe at eight tons each. Base camps for 750 people include modular housing, fuel, and supplies totaling perhaps 180 loads of 20 tons each. Sample equipment ranges from 200 ton pieces to 63 ton pieces in up to 20 or 30 in number. Factor in the building of roads,

¹² Remarks by John Kern, Director of Joint Program Development Office (JPDO) 6 May 2004.

¹³ Holmes, Dr. Bruce J, “21st Century Networking”, Aviation Week and Space Technology, Dec. 15th, 2003.

moving of the camps several times and the removal of the roads/restoration of the land and one gains an appreciation for the sheer mass of material movements and of the significant time involved. “You will note that we are not flat and do contend with tree cover. The less environmental damage by way of tree clearing or road building the better.”¹⁴ Capital is tied up during this time, with attendant direct money costs and lost opportunities.

Figure 2: Commercial Movement Example of Pipeline Transport

Figure 1: Pipe Transport



Figure 3: Commercial Movement Example of Actual Terrain (note helicopter)



Moving more traditional cargo, such as the ubiquitous 20 and 40-foot containers, is more problematic. The actual movement of containers makes little significant profit. The profit is in managing the end-to-end process where Information Technology is crucial.¹⁵ Also,

¹⁴ The information and figures shown are courtesy of Mr. John Skalski of Enbridge Pipelines, Inc. and come from his presentation at a 2002 symposium, “Airships to the Arctic” as well as continuing coordination with the author.

¹⁵ Professor Gerhardt Muller, author of Intermodal Freight Transportation, during instruction of the Strategic Intermodal Transportation course at the US Merchant Marine Academy, December 1999.

existing value networks of those organizations already serving the basic markets will resist new entrants and the capital costs of a new platform and whatever new infrastructure is required to link into existing networks are uncertain. Once airships are more established, the logical entrance points to existing markets will become evident.

US Aerospace Industry Situation

The US Aerospace Industry is a critical component of our national power. It is a key productivity engine of our economy, and the national mobility it provides is key to other businesses, many jobs, and is essential to our military mobility. It is also a system in peril.¹⁶ One example is that much of the manufacturing portion is operating at about 50% capacity, with attendant impact upon the small suppliers who support the major companies. The Commission on the Future of the United States Aerospace Industry chose as its “urgent purpose” to show that the “...critical underpinnings of this nation’s aerospace industry are showing signs of faltering.” As part of its findings the Commission has set challenging goals, such as tripling overall air transportation capacity by 2025 and to reduce the point to point time between any two points on earth by 50%.¹⁷

Visualizing the Impact of Airships and a Transformed Air Transportation Network

Picture a map of the Internet. We have all seen some sort of representation of the myriad nodes and links that reflect the hardware and the flow of electrons around the world. This represents the flow of ideas and information within human minds and through electronic means and also the physical movements of good and services, business and leisure travelers, military units, humanitarian relief supplies, and so much more. Think about the differences between the speed and amount of electrons and ideas and that of ships, planes, trucks and trains. Physical movements follow the flow of ideas and information, but obviously the physical movements cannot match the speed and volume of the intangible, so we need more platforms working more efficiently over new paths.

Two points should stand out, however. A military planner, or a transportation professional in the private sector, sees a desirable transportation network: point-to-point, unconstrained by physical limits of payload, runway length, berth and turning basin depth, etc. The second point is the robustness of a network. A terrorist attack or a storm front can now throw an entire transportation network into chaos, but a robust network that can synchronize itself and alter the flows of physical movement can absorb significant damage and still get the information and goods to destination.

Airships are a physical component of changing our existing transportation networks into more robust ones. Clearly, the management of air, sea and ground transportation, from air traffic control to highway construction to taxes and workforce issues are all critical and

¹⁶ 2003 National Research Council Report, “Securing the Future of U.S. Air Transportation—A System in Peril”.

¹⁷ All references of findings of the Commission come from the Final Report Of The Commission On The Future Of The United States Aerospace Industry, November 2002, pp. v-19. This report, and the NRC report in the above footnote agree on the urgent the need to transform the U.S. aviation system.

will make tremendous gains in the current systems. Airships, however, address specific areas that nothing else can to such a degree. Not all airspace is used right now, for instance. Airships operate best at the lowest altitudes so would not conflict with other commercial traffic. Their ability to operate free from significant infrastructure – the specifics of that phrase will vary by design and application but they do not require airports or seaports – makes them much more flexible, environmentally friendly and cheaper in many ways.

Mobilus focuses upon cargo/passenger movement as the main thrust line because only that application will generate enough revenue and enough mass to drive significant overall development. The ships developed, particularly the early ones, will also support other LTA applications such as force protection, security, communications, and others. This development will also support and encourage other efforts such as that of the stratospheric airships and aerostats. Progress in one area overlaps into others.

Figure 4: The Mobilus Domains

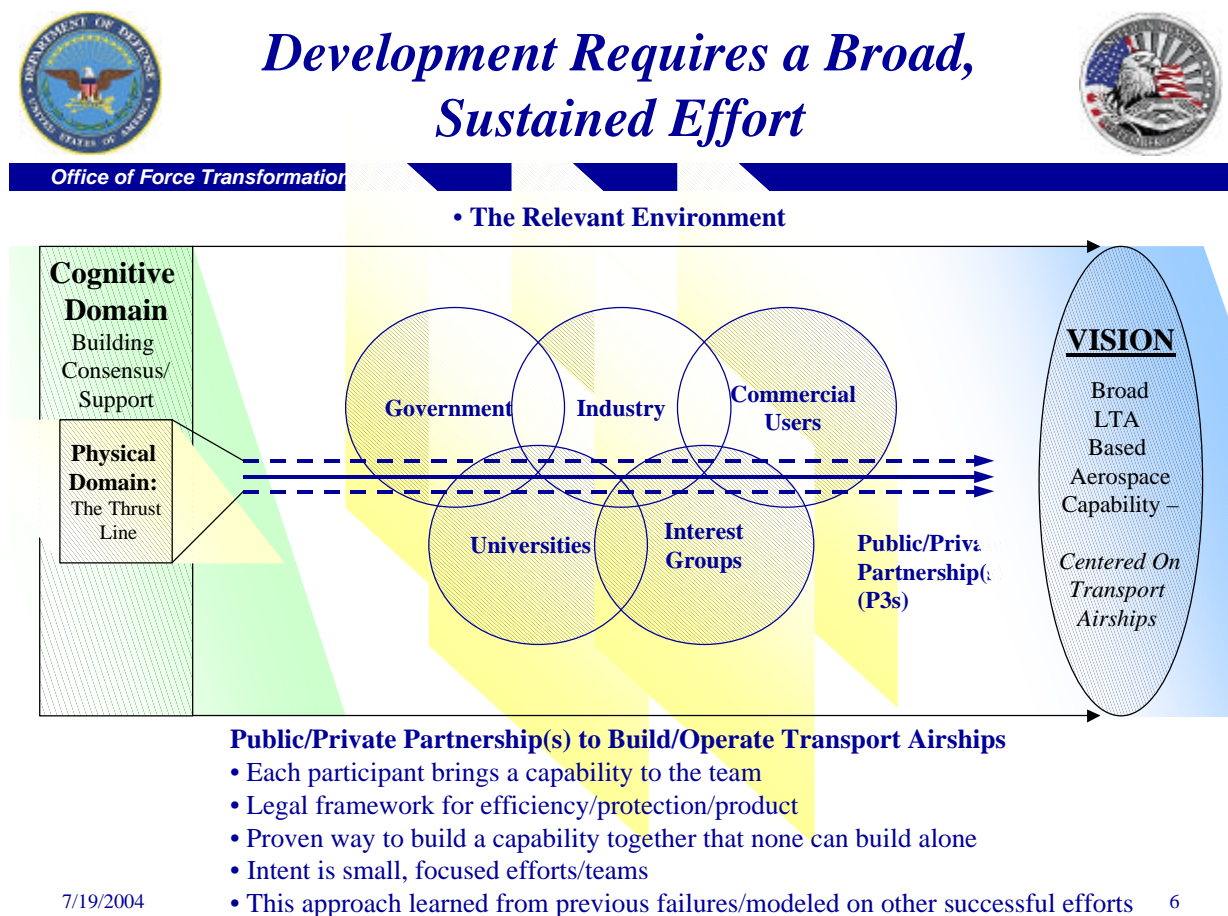


Figure 4 shows the overall environment within which airship development will occur and identifies the sectors from which key stakeholders will emerge. The linked rings also

emphasize the interrelationship of all parts of any network, particularly a transportation network. Each circle in the figure represents many organizations and individuals, public and private, who will be either direct stakeholders in a P3 or must either support or not oppose this development if it is to succeed. Some know who they are now and others do not. A significant portion of the effort will be in presenting evidence to the best potential stakeholders and sharing information to determine the shape of the value networks and their perceptions of success. Much of this will be “self discovery” as early entrants work together during the study phases to learn where their value lies. This will also promote commitment and consistency by both government and commercial participants throughout a long-term effort. These must be “win/win” situations.

Notice that there may be multiple P3s within the overall consortium approach focused on varied airship designs/commercial applications. Some development would be common to all, but each path would proceed independently. The overall intent is to build a broad capabilities base, with new companies and participants. This will produce more innovation and provide a wider choice of suppliers to military, government and commercial users. These next sections will define each circle and provide some examples of participants.

One key distinction is important. Previous alliances either included major players in established industries, or very small companies teamed with a major government organization such as NASA. In the latter, participants chose what to produce, but then faced marketing this capability for profit. There would also be an inevitable “platform focus”. Mobilus is different in including the actual end users in the process to guarantee immediate use of the airships produced. This is crucial. The airships will be designed to meet clearly defined missions/markets, not designed as a ship seeking solutions.

By including future operators, financiers and others in the process from inception we ensure a more robust capability and allow for concurrent development across the board. Obviously, this unique approach is not for everyone and is thus “self filtering”. This is good in that participants in a P3 must get along and cooperate, so only those willing and able to deal with such a climate will seek to join.

Government: Government participants have needs, such as military mobility, and also capabilities and responsibilities. The US government does not seek to own airships; it wants the capability to exist. The military can define useful capabilities – a smart push – in concert with commercial end users – a smart pull.

US government agencies have organic and unique capabilities – facilities, airspace, personnel, legal capabilities/ functions, modeling and analysis, and others to contribute “in kind”. Certification for example, should be proactive instead of reactive, shortening the existing timeline for introducing an aircraft into commercial service. In return for investment and effort, and to provide support to the fledgling “industry”, the military or other government agencies would have access to the airships in a manner similar to our CRAF program.

Another unique aspect of this consortium approach is that it must see the technology through to actual operation for commercial use. This is more evolved than current practice, where government sponsored research sometimes stops short of where commercial industry will invest.¹⁸

Multiple government entities will play a role in developing a broad LTA capability. Not all will necessarily be direct participants in one of the P3s. There is room, and need, for a great deal of mutually supporting effort.

Industry: There is no significant LTA industry in existence. Pieces exist, but all the designers, manufacturers, operators, leasing agents, and others do not exist in mass. Underutilized aviation capability does exist, such as various small component suppliers and other members of the General Aviation Manufacturers Association (GAMA). Some companies already operate heavy lift helicopters, lease aircraft, train pilots, and perform all the functions necessary. Thus, some participants will be from outside of LTA, but from within aviation.

Commercial End Users: This is the most unique aspect of the Mobilus approach. Commercial customers who understand how a cargo airship can add value to their operations will provide two important things: precise identification of performance measures that matter to them, and contributions such as funding or manpower to work in the P3, such as within the initial study phases.

Precise definition of key performance, such as necessary size of payload bay, range, allowable “footprints” or sizes of landing zones, speed and method of loading and unloading will determine selection of airship type and then the sizing, etc. This allows examination of military utility. Military and commercial push and pull will focus and propel progress.

Few if any commercial users will want to own or operate the airships. As they do now, they will rent, lease or otherwise contract for the service, not the asset. In this way they are exactly like the military. We want the capability to exist and we want to use it, but we do not want to own it. In return for their risk and investment, commercial participants would perhaps get sole right to charter the airships for some period of time.

Academia: Universities already play a key role in research and development. They will also produce the required engineers and others of the future. Universities also conduct commercial and transportation research that can guide developmental paths of airships. The best-defined markets/military uses will greatly influence design choices and formation of value networks.

Interest Groups: There are many aviation related professional organizations and other sources of support for the overall development and for specific participants. These interest groups are both public and private. Some interest groups will be State and local governments combining with other organizations to support key participants in one of the

P3s. Entities in the Interest Group “circle” may operate in the cognitive domain, the physical domain or both and will have varied degrees of influence on the overall process.

Human Factors and The Long Term View

Only a handful of experienced airshipmen and engineers remain. Luckily, many have shared their knowledge and continue to do so. Several years ago I asked Gordon Vaeth, a noted airship historian and expert, for his advice on the most critical factors in resuming development of airships for military and commercial use. He immediately answered “Training, training, training.”¹⁹ Historical research also shows that while US airships suffered structural failure for various reasons, the more lightly designed German Zeppelin airships never suffered a major structural failure. The answer, abundantly clear from many sources, is best phrased thusly; “One explanation: heedful and expert handling.”²⁰

Most argument over airships, besides those that peremptorily dismiss the potential because there are none flying or for other reasons, focuses on purely technical issues. One prevalent belief is that only technology matters. Technical progress is essential to fully achieve the potential of airships in a cargo-carrying role, especially far in the future, but the actual operation of airships is arguably more significant and also is undoubtedly more germane to initial development.

Next Steps and Next Article in the Series

This was the second in a series of articles describing the why and how of a future airship industry. A foundation must be built upon solid engineering, and the Center for Army Analysis funded by the Deputy Secretary of the Army for Operations Research and supported by a team of engineers and others are examining all existing studies and reports, of which there are hundreds, and exploring all other hard evidence. The team is comprised of veteran and new LTA talent.

The next article in this series will provide more details about the ongoing effort based upon initial insights among participants. Only hard analysis will identify logical starting points, developmental paths, and future trade space to guide development. We are working with government and private partners. The goal of this study is to:

- Identify the most logical, high-payoff development path of whatever platform type(s) are practical and possible. Conduct parametric analysis of realistic performance expectations in areas such as--speed, range, payload (dimensions and weight), operating altitude, required ground space,

¹⁹ J. Gordon Vaeth served as air intelligence officer to the Atlantic Fleet airship commander in WWII. Gordon also worked in commercial airship operations and served a long career in the National Oceanic and Atmospheric Administration. He is the author of two superb books, Graf Zeppelin: The Adventures of an Aerial Globetrotter, and Blimps and U-Boats: US Navy Airships in the Battle of the Atlantic. Both are well written and provide a wealth of information on airships.

²⁰ Althoff, William F., USS Los Angeles: The Navy's Venerable Airship and Aviation Technology, p. xiii. There are myriad examples of the criticality of careful handling, and of the consequences of the alternative. Another good reference is SkyShips: A History of Airships in the United States Navy by the same author.

infrastructure, and load/unload time--of various potential ULA designs. Highlight “trade offs” between the various factors

- Identify and prioritize future S&T and R&D efforts to push development along the path identified as most useful.
- Identify all the necessary steps to design, build, test and certify ULAs.
- Identify key commercial markets. Initially, markets will not be traditional ones. Instead, moving Big, Ugly Freight (BUF) to remote locations and other applications that are currently not done will be the path of least resistance. This is a case where “...creating new markets is significantly *less* risky and *more* rewarding than entering established markets against entrenched competition.”²¹

The most sensible approach is to start with what is technically possible here and now and build upon that. Much information exists that shows what has been proven to work and what experienced engineers and operators suggested as the next steps of improvement. Things such as modifications to the shape, drag reduction, and stern propulsion are merely a few immediate advances. Longer term, buoyancy control and low speed handling control will be crucial, and much work remains in those areas.

Commercial interest exists right now for certain defined and quantifiable markets. Evidence suggests many other markets are also fertile ground for the right LTA application at reasonable cost.

Figures 5 and 6 below provide two ways to understand the spectrum of potential airship types that may exist. They demonstrate the varied types of aircraft and airships and how each relates to another. We are gathering data on many of the types shown.

²¹ Christensen, Clayton M. The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail, p. 125.

Figure 5: Aircraft/Airship Terminology²²

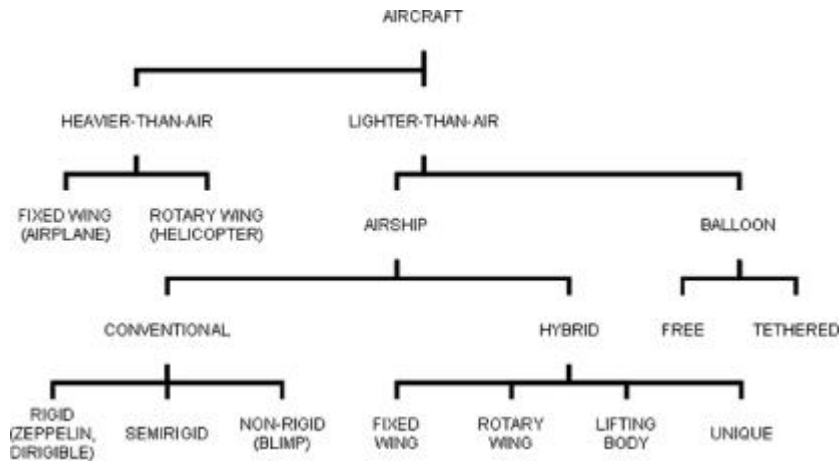
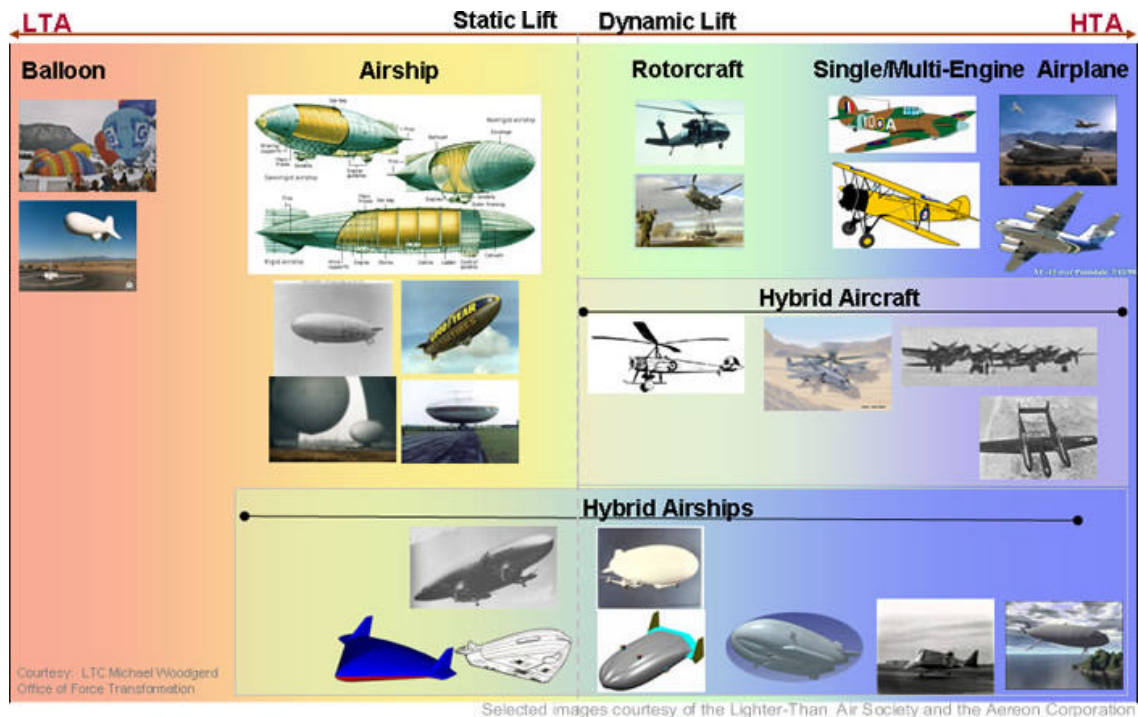


Figure 6: Aircraft Spectrum



²² Figure by Mark Ardema, "Missions and Vehicle Concepts for Modern, Propelled, Lighter-Than-Air Vehicles", AGARD Report No.724, Feb 85. Agrees with multiple other LTA and aviation authors and reviewers.

Conclusion

Mobilus is fundamentally a Vision upon which many individuals and entities can focus effort and also the method to build a major new sector of the US, and then the world, aerospace industry. By building a broad, firm industrial base of airships and related LTA applications (stratospheric airships, for example) and building it in a new and commercially driven manner, our Nation gains mobility and economic power; perhaps even a dominant place in world aviation. It is also a challenge for entrepreneurs, engineers, and other pioneers who seek a challenge and seek the rewards of being pioneers in a disruptive technology. Mobilus offers opportunity to build systems, businesses, and other things that do not now exist, but can exist, and should exist.

The modern world exists as it does to a great degree because of transportation. Creating transportation links such as the Trans-Continental Railroad and the Panama Canal were challenges not only of technical skill but also of organizational, governmental and financial imagination and audacity. In the 19th Century, the Trans-Continental Railroad linked the nation and formed a backbone of economic power.²³ The unique financing of the construction set an example. In the 20th Century, the Panama Canal changed international trade and economics forever. Mobilus may be the great transportation challenge of the 21st Century. Innovation will create airships beyond any seen before. New trade routes will spread north and south in the Americas and reach into land-locked, impoverished, countries throughout the world. Innovation will create new markets, improve processes across business categories, and do other things not yet imagined.

Mobilus provides a coherent, logical development plan to encourage/focus/accelerate development of a civilian aerospace capability centered upon LTA capabilities. The analysis of multiple platforms' developmental paths, the high-payoff commercial applications, the methodology of how multiple public-private partnerships would create this broad capability will be the first of its kind. It will support the collaborative approach that will drive development across a broad array of technical types, varied geographic areas, and accelerate the broad capability much faster than the old style approach of traditional contracts focused on one type of platform.

Without a Vision we will get nowhere, and without a method that accounts for all the reasons that so far have prevented a continuation of airship development, we will also get nowhere. "Transformation needs new government processes and policies, more attention to free market incentives, and development and deployment of new technologies."²⁴ Two quotes should guide us. The first is a Korean proverb; "We plant the trees so that others may enjoy the shade." The second is of more recent vintage; "Sometimes you gotta create what you want to be a part of."²⁵

²³ A similar effort did the same for Canada as well.

²⁴ Dr. Bruce J. Holmes

²⁵ Geri Weitzman

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